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Partial helical order in Fe_3PO_7 COLIN SARKIS, MICHAEL TARNE, Colorado State University, HUIBO CAO, Oak Ridge National Lab, JAMES R. NEILSON, KATE A. ROSS, Colorado State University — For most magnetic systems, a particular ground state is chosen at low enough temperatures. For partially ordered states, there exists an extended manifold of possible ordering wavevectors available, from which the system cannot pick a unique solution, and instead shows short range order. Partial order has been observed, for example, in the Skrymion-lattice hosting materials MnSi and $Fe_{1-x}Co_xSi$, and in the latter it was shown to be the precursor to the Skyrmion lattice phase. Polycrystalline iron phosphate oxide (Fe_3PO_7) has been previously shown to host nanosized antiferromagnetic helical domains, implying a large number of topological defects are present below $T_N = 163$ K. Here we present Neutron Diffraction data on single crystal Fe_3PO_7 which definitively shows partial order as evidenced by a continuous ring of scattering instead of well-defined Bragg peaks. This can be understood in terms of the competition between J_1 (nearest neighbor) and J_2 (next nearest neighbor) interactions in a Heisenberg model, which produces a quasi-degenerate manifold of ordering wavevectors. The partial order appears to be linked to the presence of topological defects, but at this point the origin of the latter is not well understood.

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